

A Case of Folded Corevalve: The Importance of Baseline Computed Tomographic Information

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Abstract

Transcatheter aortic valve implantation (TAVI) without balloon pre-dilation is feasible and safe, resulting in similar acute safety and efficacy as the current standard approach of TAVI with pre-dilation. The valve distortion during the CoreValve implantation is thought likely to be due to a fold generated on the inflow end of the valve. The fold may persist if deployed into an annulus with a high degree of calcification and can be restored the normal frame shape. We describe the folded Corevalve as the complication of TAVI without balloon pre-dilation technique.

Keywords: *Transcatheter Aortic Valve Implantation; Folded Valve; Balloon Predilation*

Introduction

In patients with severe calcific aortic stenosis (AS), balloon aortic valvuloplasty (BAV) is routinely performed in order to pre-dilate the stenosed aortic valve prior to Transcatheter aortic valve implantation (TAVI). Although pre-dilation is considered to be essential for the preparation of the valve landing zone, there is no clear evidence to support its clinical value. BAV as pre-dilation has been shown to have numerous detrimental effects: i) the functional cardiac arrest induced by rapid pacing for BAV leads to transient organ ischemia. ii) In patients with impaired left ventricular ejection fraction, prolonged cardiac depression after rapid pacing is observed and may result in hemodynamic failure iii) BAV has been identified as a major source of embolization iv) The local trauma in the left-ventricular outflow tract caused by BAV contributes to conduction disturbances with the need for permanent pacemaker implantation after TAVI and increases the risk of annular rupture [1]. However, some concerns remain in patients with heavily calcified and/or bicuspid valves. Here we report the folded Corevalve as the complication of TAVI without balloon pre-dilation technique.

Case

A 78 years-old gentleman was admitted with dyspnea on exertion (New York Heart Association functional classification class III). He received the transarterial chemoembolization several times because he suffered the hepatocellular carcinoma related with chronic hepatitis B virus infection. He also received the transcatheter portocaval shunt. His STS score was 6.8%. Our heart valve team members consulted to hepatologist and he reported patient's remained survival time would be more than 1.5 to 2 years. And then our team discussed to the patient and the patient's family members and we finally decided to do a TAVI.

Transthoracic echocardiography showed a severe degenerative aortic AS with tricuspid morphology, mild aortic regurgitation, and concentric left ventricular hypertrophy with normal left ventricular systolic function. Aortic valve (AV) area by continuity equation was 0.85 cm². Trans AV maximal velocity was 4.4 m/s. Peak and mean pressure gradient were 78 and 44 mmHg, respectively. Baseline computed tomographic (CT) findings showed a heavily eccentric calcified AV with severe calcification observed between right coronary cusp

(RCC) and non-coronary cusp (NCC). Annulus size by CT was 24.8 - 27.6 mm and perimeter (defined as the linear distance of tracing around the AV) was 86mm. Distance from annulus to left main and right coronary were 17.9 and 20.2 mm, which were long enough for TAVI.

A 31-mm CoreValve implantation (Medtronic, Minneapolis, USA) without balloon pre-dilation was performed by transfemoral access under general anesthesia. Immediately after valve implantation, CoreValve looked like incomplete deployment unevenly (“folded valve”) in especially right anterior oblique (RAO) cranial projection (Figures 1, 2). During the implantation, we didn’t lose the wire and then we reminded the baseline CT imaging information. We decided to balloon post-dilation using a 25 m×4 cm Z-med balloon (NuMed Inc., Hopkinton, NY, USA) under rapid ventricular pacing. After balloon post-dilation, root angiography showed full expansion of the implanted valve and minimal paravalvular regurgitation.

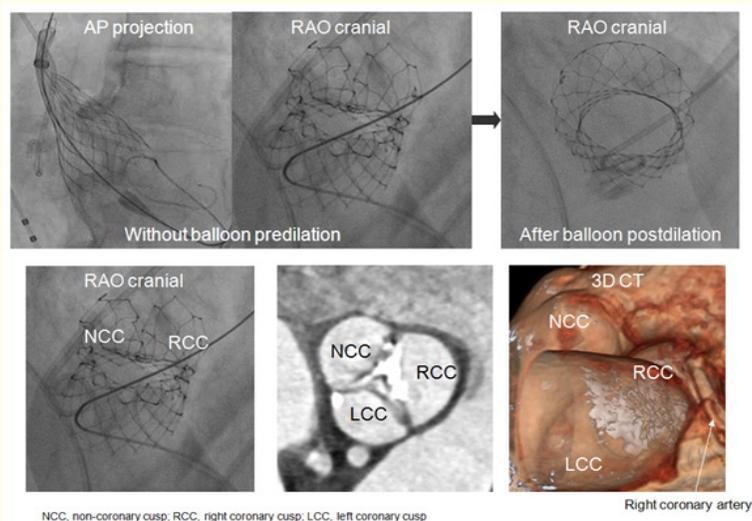


Figure 1: Fluoroscopic images during the implantation of the CoreValve and baseline CT images.

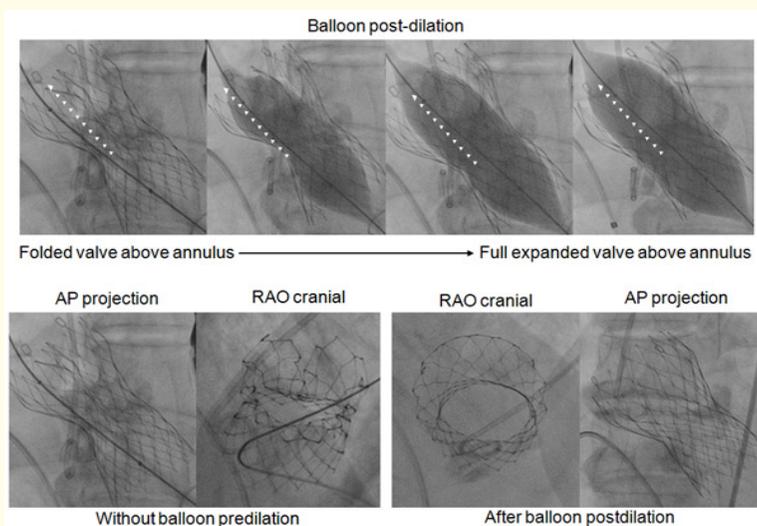


Figure 2: Serial fluoroscopic demonstration before and after post-dilation.

Discussion

According to this case, our catheterization laboratory have the strategy based on the “without balloon pre-dilation technique”. The avoidance of rapid pacing and balloon pre-dilatation of the native AV in TAVI patients might be an option to reduce coronary ischemia with peri-procedural cardiac depression of left ventricular function in patients with reduced left ventricular function, events of embolization causing stroke or myocardial infarction, and renal ischemia with the induction of acute kidney injury [1].

In recent some studies, compared to TAVI with balloon pre-dilation, direct TAVI is feasible regardless of the presence of bulky calcified aortic valve and the valve size implanted. Device success was higher in direct TAVI, mostly driven by a lower incidence of paravalvular leak [2-5]. Without balloon pre-dilation, usually not many patients have complications. The radial force provided by the TAVI device itself is sufficient to guarantee a good expansion of the valve in most self-expanding CoreValve cases. However, in this patient, because of pre-existing eccentric heavy calcification between two cusps, choosing to do initial balloon pre-dilation technique would have been a better choice.

Baseline CT image can supply the information for amount, distribution, and location of valve calcium beyond the size of annulus. Calcific aortic valve stenosis is pathologically characterized by thickening of the aortic valve cusps with large calcific nodules that protrude on the aortic surface of the cusps. Unlike surgical aortic valve replacement, the diseased aortic cusps are not removed in TAVI. Aortic valve calcification has also been speculated to be associated with increased risk for prosthesis dislodgement, reported in 4% - 18% of several series [2].

Four similar cases was reported in three literatures that the valve distortion is thought likely to be due to a fold generated on the inflow end of the valve during loading onto the delivery system. The fold persisted in three of the four cases with a high degree of constraint in spite of post-ballooning [2-4]. But our case has some different points that the complete expansion of the folded Corevalve was performed and folding cause was clearly proven with the baseline CT images.

This case supply the practical lessons in patients with heavily eccentric calcified native valve as follows; 1) operator would be better to choice the initial balloon pre-dilation technique in such a case or 2) operator would differentiate technical errors such as loading failure from folded valve like this case based on the baseline CT information [6-9].

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